Sight Conservation Training

How The Eye Works

To understand how we can lose our sight and the things we need to protect our eyes we must first understand how sight works. This section explains the science of sight and the factors involved in sight loss.

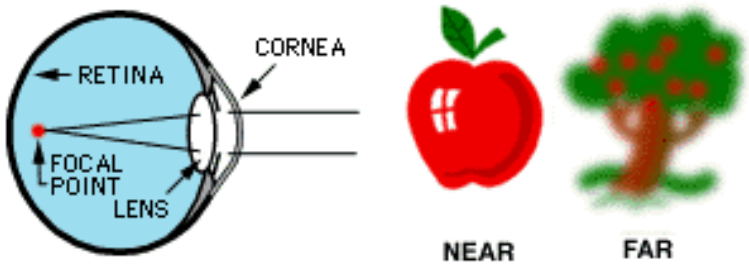
Light and the Outer Portion of the Eye

As light hits an object, certain wavelengths are absorbed and others are reflected off the surface back into the air. The light rays that objects reflect or give off do not naturally move toward one another. For light to be seen, the rays that are reflected off of the object must be focused to a point. This is the job of the cornea and the lens of the eye. The cornea and lens bend the light to a focal point. This concentrates the light rays that normally would be scattered.

The cornea provides most of the bending power of the eye. After light rays pass through the cornea, they travel through the aqueous humor (fluid in the front part of the eye) and the pupil to the lens. The lens bends the rays even closer together before they enter the inner portion of the eye.

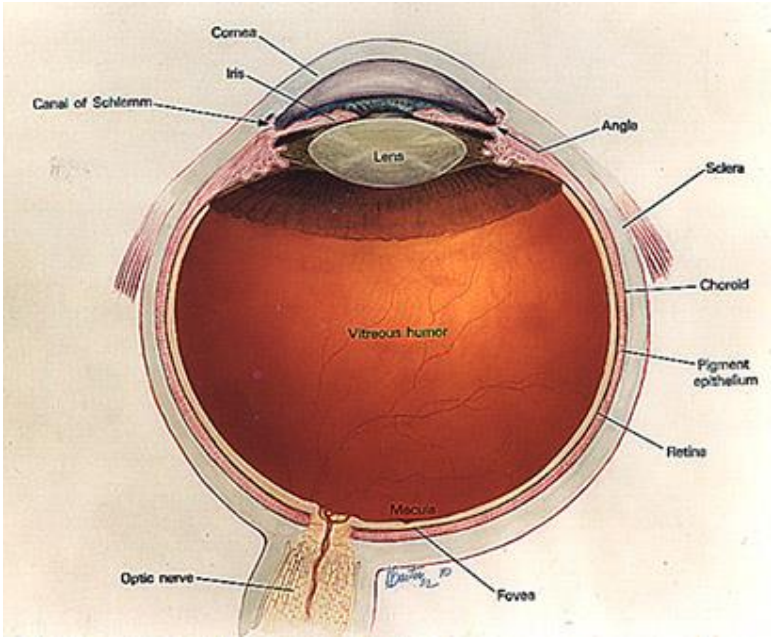
The bending power of the lens changes constantly as the eye shifts focus between nearby objects and distant ones. Light rays from nearby objects spread out and those from distant objects travel nearly parallel. Therefore, the lens must provide greater bending power for the light rays from nearby objects to come together. The muscles of the eye help the lens change shape. This focusing of the lens is produced by the relaxing and contracting of the muscles of the ciliary body.

Damage to the cornea, lens, and muscles of the ciliary body can cause sight loss. Also changes to the fluid or aqueous humor can also cause sight loss.



The Inner Portion of the Eye

After light is bent by the lens for the last time, it enters the inner portion of the eye and passes through the vitreous humor (the liquid in the inner portion of the eye). The lens focuses the light rays to a point that hit a tiny pit in the center of the back wall of the eyeball. This pit is called the fovea centralis and is the area of sharpest vision. When an eye looks upon an object the light from that object is focused toward the fovea centralis. Light from around the sides of the object will land on the back wall of the eyeball around the fovea centralis. These areas do not have as sharp a vision as the fovea centralis.



The back wall of the eyeball is made of special nerve cells called rods and cones. These special cells pass the signals to the brain about the intensity of light which hit them. The brain in turn interprets these signals as objects shapes and colors or vision.

If the focal point of the light does not hit the fovea centralis, then vision is blurred. This can happen when there is damage to the lens or if the eyeball is misformed or mishaped. Also vision can be impaired when the rods and cones are damaged. This can happen when a bright light is focused on the back wall of the eyeball.

Depth Perception

Depth perception is the ability to judge distance and to tell the thickness of objects. The ability of the brain to interpret images begins at a person's birth. The optic nerves from the two eyes meet at the base of the brain at a point called the optic chiasm. At this point half the nerves fibers from each eye cross over and join the fibers from the other eye. Each side of the brain receives visual messages from both eyes. The nerve fibers from the right half of each eye enter the right side of the brain. These fibers carry visual messages from objects that are to a person's left. The nerve fibers from the left half of each eye enter the left side of the brain. These fibers carry visual messages from objects that are to a person's right. If one side of the brain becomes damaged, as in a stroke or tumor, the opposite side of a person's field of vision may be reduced.

Each eye sees things from a slightly different angle and sends slightly different messages to the brain. The brain puts the images together and gives the object depth or thickness. The brain can also judge distance from an object because of these differences. Normal depth perception requires that the eyes work together in a process called binocular vision. In this process the muscles of the eyeball work together to focus the light rays from an object on corresponding sections of the back wall of the eyeball. If the muscles of the eyes do not work properly and do not put the light in the correct positions of the back wall of the eyeball, vision becomes blurred or double.

Sight Loss

Defects to the Eye

Defects of the eye are among the most common of all physical disorders. Certain defects cannot be cured, but vision can be made normal by means of corrective lenses. The chief defects of the eye include:

Nearsightedness or myopia is characterized by blurred distance vision. This is caused by the malformation of the eyeball causing it to be elongated. This can be corrected through lenses.

Farsightedness or hyperopia is characterized by blurred near vision. This is caused by the malformation of the eyeball causing it to have a short distance from the front to back of the eye. This can be corrected through lenses.

Astigmatism is characterized by blurred distance and near vision. This is caused by the cornea being misshapen, keeping all light rays from being brought together into a focal point. This can be corrected through lenses.

Strabismus is characterized by the eyes not working together. One of the eyes is deviated from the normal line of vision. This is usually caused by weakened muscles and can be corrected by surgery or eyedrops.

Color Blindness is characterized by the brain confusing some colors with other colors. This defect is caused by abnormalities in the pigments of the rods and cones. This condition cannot be corrected.

Diseases of the Eye

Disease may affect any part of the eye. Eye diseases cause about 95 per cent of all blindness in the United States. Eye diseases include:

- **Cataract is a condition in which part or all of the lens becomes clouded. Cataracts are usually caused by aging and can only be treated by removing the clouded lens.**
- **Glaucoma is a disease in which the aqueous humor does not drain properly causing pressure in the eye to increase and this in turn causes damage to the optic nerve. Damage to the optic nerve can not be reversed and is permanent. Glaucoma is also associated with aging, but can be caused by certain illnesses. Glaucoma is treated with eye drops or surgery.**
- **Various diseases can affect the outer parts of the eyes.**
  - **A Sty is an infection of an eyelash sac.**
  - **A Chalazion is a blocked gland along the eyelid.**
  - **Conjunctivitis is an inflammation of the membrane that lines the eyelids and covers part of the eyeball. Conjunctivitis is also called pinkeye.**

Any of these infections or inflammations can spread and cause damage to the outer portions of the eyes if they are not treated and corrected.

What a person with glaucoma sees.

Sight Loss and Work

OSHA Fact Sheets
01/01/1993 - Eye protection in the workplace
Record Type: Fact Sheets **Subject:** Eye protection in the workplace
Information Date: 01/01/1993 **Fact Sheet:** 93-03
U.S. Department of Labor
Program Highlight

Fact Sheet No. OSHA 93-03

EYE PROTECTION IN THE WORKPLACE

Every day an estimated 1,000 eye injuries occur in American workplaces. The financial cost of these injuries is enormous -- more than $300 million per year in lost production time, medical expenses, and workers compensation. No dollar figure can adequately reflect the personal toll these accidents take on the injured workers.

The Occupational Safety and Health Administration (OSHA) and the 25 states and territories operating their own job safety and health programs are determined to help reduce eye injuries. In concert with efforts by concerned voluntary groups, OSHA has begun a nationwide information campaign to improve workplace eye protection.

Take a moment to think about possible eye hazards at your workplace. A 1980 survey by the Labor Department's Bureau of Labor Statistics (BLS) of about 1,000 minor eye injuries reveals how and why many on-the-job accidents occur.

Sight Loss and Work

WHAT CONTRIBUTES TO EYE INJURIES AT WORK?

-- Not wearing eye protection. BLS reports that nearly three out of every five workers injured were not wearing eye protection at the time of the accident.

-- Wearing the wrong kind of eye protection for the job. About 40% of the injured workers were wearing some form of eye protection when the accident occurred. These workers were most likely to be wearing protective eyeglasses with no side shields, though injuries among employees wearing full-cup or flat-fold side shields occurred, as well.

WHAT CAUSES EYE INJURIES?

-- Flying particles. BLS found that almost 70% of the accidents studied resulted from flying or falling objects or sparks striking the eye. Injured workers estimated that nearly three-fifths of the objects were smaller than a pin head. Most of the particles were said to be traveling faster than a hand-thrown object when the accident occurred.

-- Contact with chemicals caused one-fifth of the injuries. Other accidents were caused by objects swinging from a fixed or attached position, like tree limbs, ropes, chains, or tools which were pulled into the eye while the worker was using them.

WHERE DO ACCIDENTS OCCUR MOST OFTEN?

-- Craft work; industrial equipment operation. Potential eye hazards can be found in nearly every industry, but BLS reported that more than 40% of injuries occurred among craft workers, like mechanics, repairers, carpenters, and plumbers. Over a third of the injured workers were operatives, such as assemblers, sanders, and grinding machine operators. Laborers suffered about one-fifth of the eye injuries. Almost half the injured workers were employed in manufacturing; slightly more than 20% were in construction.

Sight Loss and Work

HOW CAN EYE INJURIES BE PREVENTED?

-- Always wear effective eye protection. OSHA standards require that employers provide workers with suitable eye protection. To be effective, the eyewear must be of the appropriate type for the hazard encountered and properly fitted. For example, the BLS survey showed that 94% of the injuries to workers wearing eye protection resulted from objects or chemicals going around or under the protector. Eye protective devices should allow for air to circulate between the eye and the lens. Only 13 workers injured while wearing eye protection reported breakage.

Nearly one-fifth of the injured workers with eye protection wore face shields or welding helmets. However, only six percent of the workers injured while wearing eye protection wore goggles, which generally offer better protection for the eyes. Best protection is afforded when goggles are worn with face shields.

Better training and education. BLS reported that most workers were hurt while doing their regular jobs. Workers injured while not wearing protective eyewear most often said they believed it was not required by the situation. Even though the vast majority of employers furnished eye protection at no cost to employees, about 40% of the workers received no information on where and what kind of eyewear should be used.

-- Maintenance. Eye protection devices must be properly maintained. Scratched and dirty devices reduce vision, cause glare and may contribute to accidents.

Sight Loss and Work

WHERE CAN I GET MORE INFORMATION?

-- Your nearest OSHA area office. Safety and health experts are available to explain mandatory requirements for effective eye protection and answer questions. They can also refer you to an on-site consultation service available in nearly every state through which you can get free, penalty-free advice for eliminating possible eye hazards, designing a training program, or other safety and health matters.

Don't know where the nearest federal or state office is? Call an OSHA Command Office at the U.S. Department of Labor in Boston, New York, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, or Seattle.

-- The National Society to Prevent Blindness. This voluntary health organization is dedicated to preserving sight and has developed excellent information and training materials for preventing eye injuries at work. Its 26 affiliates nationwide may also provide consultation in developing effective eye safety programs. For more information and a publications catalog, write Prevent Blindness America, 500 E. Remington Road, Shaumburg, IL 60173, 800-331-2020. http://www.preventblindness.org

EYE PROTECTION WORKS!

BLS reported that more than 50% of workers injured while wearing eye protection thought the eyewear had minimized their injuries. But nearly half the workers also felt that another type of protection could have better prevented or reduced the injuries they suffered.

It is estimated that 90% of eye injuries can be prevented through the use of proper protective eyewear. That is our goal and, by working together, OSHA, employers, workers, and health organizations can make it happen.

NAVOSH Sight Conservation Program

The Occupational Safety and Health Administration provides regulations to protect the worker from hazardous environments that will harm eyesight. OSHA and the Navy require a specific program to protect its workers from these environments. This section explains the NAVOSH Sight Conservation Program.

The Regulations

OSHA sets forth standards for eye protection in 29 CFR 1910.133. This standard requires employers to reduce employee exposures to hazardous eye environments by providing employees with personal eye protection and encouraging them to wear such protection. Part of the general requirements of this standard are found below.

1910.133

(a)

General requirements.

(a)(1)

The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

(a)(2)

The employer shall ensure that each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.

(a)(3)

The employer shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

NAVOSH Sight Conservation Program

OPNAVINST 5100.23(series)

Chapter 20 in OPNAVINST 5100.23(series) spells out the Navy's responsibility for protecting employees sight:

2004. Eye and Face Protection

Employees shall wear approved eye and face protection when there is a reasonable probability that wearing such equipment will prevent injury. They shall use eye protection at all times in a designated eye hazard area. Flying particles and chips; splashes from liquids such as acids, caustics and solvents; and operations that generate hot slag or molten metal, welding glare, etc., can cause eye and/or face injury. The activity shall provide the required approved protective equipment and enforce usage.

Chapter 19 in OPNAVINST 5100.23(series) spells out the Navy's Sight Conservation Program which includes the following five elements:

1901. Discussion

1. Identification and evaluation of eye hazardous areas, processes and occupations
2. Prescription Protection Eyewear Program
3. Provision and maintenance of appropriate personal protective equipment (PPE) at government expense
4. An employee training, promotion and emphasis program
5. Effective program enforcement

NAVOSH Sight Conservation Program

Basic Sight Program

1902. Basic Program Requirements

Emergency Eyewash Facilities. The responsibility for managing eyewashes rests with the owner of the work process that requires eyewashes (e.g., region, activity, etc.). Regions or activities shall provide emergency eyewash facilities meeting the requirements of reference 19-1 in all areas where the employees' eyes may be exposed to corrosive materials. All such emergency facilities shall be located where they are easily accessible to those in need. Work centers shall activate plumbed eyewash units weekly for a period long enough to verify operation and flush the line. During annual inspection, verification of the weekly eyewash activation is recommended. Quarterly verification, typically by the safety office is recommended. Activation may be required more frequently if the region's/activity's safety and/or occupational health staff determine it is necessary to ensure proper functioning and performance of the eyewash station. Inspection and maintenance tags should be placed on self-contained eyewash units to document most current inspection/maintenance.

NAVOSH Sight Conservation Program

Regions or activities shall service pressurized and non-pressurized self-contained eyewash units quarterly, as a minimum, or per the manufacturer's recommendations, whichever is more frequent. Periodic maintenance shall include cleaning of the unit, replacement of water (depending on manufacturer’s recommendation), and checking for proper operation. Where an additive is used in a self-contained eyewash unit, regions or activities shall use additives specified by the manufacturer, and change fluid at an interval recommended by the manufacturer of the additive. Work centers shall maintain written, dated and signed maintenance records for a period of one year.

Regions and activities should only use self-contained eyewash units on a temporary basis until permanent emergency eyewash facilities are installed or at remote locations where water is not readily available. Regions and activities shall not use personal eyewash units for work with corrosives. For other work operations not involving corrosives, personal eyewash units can only be used on a case-by-case basis with approval from the region/activity OSH staff.

NAVOSH Sight Conservation Program

Eyewear

1903. Occupational Eye Care Services and Equipment

The activity OSH office shall consult with supply officers and the cognizant medical activity to determine the most suitable procurement procedures when prescription protective eyewear is required. When Navy medicine provides these services, all medical forms and evaluations must be documented according to the Bureau of Medicine and Surgery Manual of Medical Department, NAVMED P117.

1904. Temporary Protective Eyewear

Where protective corrective eyewear is necessary, activities shall provide planos or goggles to visitors, instructors and others who must enter or pass through eye hazardous areas. In addition, they shall be provided to employees awaiting delivery of corrective-protective eyewear.

My Responsibility to Protect My Sight

Sight loss is a serious matter. Temporary changes in sight can occur on a day-to-day basis or sight can be lost in one drastic accident. However, an employer can spend thousands of dollars and take several measures to protect your sight to no avail if you do not take responsibility for your own sight.

At Work

Injured workers surveyed indicated that eye and face protection was not normally used or practiced in their work areas or it was not required for the type of work performed at the time of the accident.

Almost one-third of face injuries were caused by metal objects, most often blunt and weighing one pound or more. Accidents resulted in cuts, lacerations, or punctures in 48% of the total, and fractures (including broken or lost teeth) in 27%.

Protection should be based on kind and degree of hazard present and should:

- be reasonably comfortable
- fit properly
- be durable
- be cleanable
- be sanitary
- be in good condition

My Responsibility to Protect My Sight

Prevention is the only way to protect your sight. Your employer has a responsibility to protect you from hazardous environments at work. It is your employer's responsibility to evaluate the workplace for hazards that can harm your eyes, to provide engineering and administrative controls to abate these hazards, to provide you with testing and personnel protective devices to protect you from further loss of sight, among other measures.

However, an employer can spend thousands of dollars and take several measures to protect your sight to no avail if you do not take responsibility for your own eye and face protection. As an employee you also have a responsibility to protect your sight. You should:

- inform your supervisor if you feel your work place have hazards that include flying particles and chips; splashes from liquids such as acids, caustics and solvents; and operations that generate hot slag or molten metal, welding glare, etc.
- participate in eye examinations provided by your employer.
- attend training provided by the employer.
- wear personal protective devices provided by the employee to protect your eyes and face.
- follow procedures set up as administrative controls to protect you from hazards associated with you eyes and face.

My Responsibility to Protect My Sight

Away from Work

You only have one pair of eyes. You can't take off a work set of eyes and put on a home set! Hazardous environments that include flying particles and chips; splashes from liquids such as acids, caustics and solvents; and operations that generate hot slag or molten metal, welding glare, etc. are also common away from work. Below are some common hazardous eye environments found away from the work place.

- **Mowing the lawn**
- **Using Liquid Plumber to unclog drains**
- **Chainsaw work**
- **Suntan booths**
- **Cooking with hot peppers or spices**

Working in these environments without protecting your eyes could lead to damage that may end up being permanent. Loss of eye sight can have a profound effect on your job, whether it occurred to you on the job or at home.

Protect your eyes in ALL hazardous situations!

Personal Protective Devices for Your Face and Eyes

Introduction

Eye and face protective equipment is required by OSHA where there is a reasonable probability of preventing injury when such equipment is used. Employers must provide a type of protector suitable for work to be performed, and employees must use the protectors. These stipulations also apply to supervisors and management personnel, and should apply to visitors while they are in hazardous areas.

Suitable eye protectors must be provided where there is a potential for injury to the eyes or face from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially injurious light radiation or a combination of these. Protectors must meet the following minimum requirements:

- Provide adequate protection against the particular hazards for which they are designed
- Be reasonably comfortable when worn under the designated conditions
- Fit snugly without interfering with the movements or vision of the wearer
- Be durable
- Be capable of being disinfected
- Be easily cleanable
- Be kept clean and in good repair
- Every protector shall be distinctly marked to facilitate identification of the manufacturer.

Personal Sight Protective Devices

Face Shields and Goggles

Each eye, face, or face-and-eye protector is designed for a particular hazard. In selecting the protector, consider kind and degree of hazard, and select the protector accordingly. Where a choice of protectors is given, and the degree of protection required is not an important issue, worker comfort may be a deciding factor. The BLS survey showed that few workers ever complained about poor vision or discomfort with personal eye protection equipment.

Goggles come in a number of different styles: eyecups, flexible or cushioned goggles, plastic eyeshield goggles, and foundrymen's goggles. Goggles are manufactured in several styles for specific uses such as protecting against dusts and splashes, and in chipper's, welder's, and cutter's models.

Many hard hats and nonrigid helmets are designed with face and eye protective equipment.

Design, construction, tests, and use of eye and face protection purchased prior to July 5, 1994, must be in accordance with ANSI Z87.1-1968 USA Standard Practice for Occupational and Educational Eye and Face Protection. Protective eye and face devices purchased after July 5, 1994, must comply with ANSI Z87.1-1989, American National Standard Practice for Occupational and Educational Eye and Face Protection.

Personal Sight Protective Devices

Inspection and Maintenance

It is essential that the lenses of eye protectors be kept clean. Continuous vision through dirty lenses can cause eye strain often an excuse for not wearing the eye protectors. Daily inspection and cleaning of the eye protector with soap and hot water, or with a cleaning solution and tissue, is recommended.

Pitted lenses, like dirty lenses, can be a source of reduced vision. They should be replaced. Deeply scratched or excessively pitted lenses are apt to break more readily.

Slack, worn-out, sweat-soaked, or twisted headbands do not hold the eye protector in proper position. Visual inspection can determine when the headband elasticity is reduced to a point below proper function.

Goggles should be kept in a case when not in use. Spectacles, in particular, should be given the same care as one's own glasses, since the frame, nose pads, and temples can be damaged by rough usage.

Personal Sight Protective Devices

FACESHIELDS

- Provide eye and face protection against flying particles, sparks and chemical splash. When used with a tinted shield, they also protect against glare.
- Faceshields are ideally suited to offer protection during light chipping and grinding work, wood working, chemical handling, lab work and similar activities.

GOGGLES

Goggles are designed for a variety of applications - Dust Protection, Chemical Protection, Chipping, Grinding and Welding.

Personal Sight Protective Devices

Safety Spectacles

Each eye, face, or face-and-eye protector is designed for a particular hazard. In selecting the protector, consider kind and degree of hazard, and select the protector accordingly. Where a choice of protectors is given, and the degree of protection required is not an important issue, worker comfort may be a deciding factor. The BLS survey showed that few workers ever complained about poor vision or discomfort with personal eye protection equipment.

Persons who use corrective spectacles and those who are required by OSHA to wear eye protection must wear face shields, goggles, or spectacles of one of the following types:

Spectacles with protective lenses providing optical correction;

Goggles or face shields worn over corrective spectacles without disturbing the adjustment of the spectacles; or

Goggles that incorporate corrective lenses mounted behind the protective lenses.

When limitations or precautions are indicated by the manufacturer, they should be communicated to the user and strictly observed.

Over the years, many types and styles of eye and face-and-eye protective equipment have been developed to meet the demands for protection against a variety of hazards.

Safety spectacles require special frames. Combinations of normal streetwear frames with safety lenses are not in compliance.

Prescription safety spectacles should be fitted only by qualified optical personnel.

Personal Sight Protective Devices

Inspection and Maintenance

It is essential that the lenses of eye protectors be kept clean. Continuous vision through dirty lenses can cause eye strain often an excuse for not wearing the eye protectors. Daily inspection and cleaning of the eye protector with soap and hot water, or with a cleaning solution and tissue, is recommended.

Pitted lenses, like dirty lenses, can be a source of reduced vision. They should be replaced. Deeply scratched or excessively pitted lenses are apt to break more readily.

Each affected employee shall use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation.

The End

Now that you have reviewed the Sight Conservation Awareness Training, it is time to complete the learning evaluation exercise.